Table of Contents

	PAGE
Preliminary Statement	1
Questions Presented	2
Interest of *Amicus Curiae*	2
Summary of Argument	4
ARGUMENT	6
I. MATHEMATICAL EXPRESSIONS AND ALGORITHMS ARE NOT EMBRACED IN THE "USEFUL ARTS" AND SHOULD NOT BE PATENTABLE	6
A. The Essence of Respondents' Contribution Is a Modification of a Well-Known Algorithm or Mathematical Expression	6
B. Mathematical Expressions and Algorithms Are Part of the "Liberal Arts" and Not Part of the "Useful Arts"	9
II. MATHEMATICAL EXPRESSIONS OR ALGORITHMS ARE NOT PATENTABLE EVEN THOUGH THEY MAY BE PROGRAMMED ON A GENERAL-PURPOSE DIGITAL COMPUTER	10
III. RESPONDENTS HAVE ATTEMPTED TO SHIFT THE ESSENCE OF THEIR CONTRIBUTION FROM AN ALGORITHM OR MATHEMATICAL EXPRESSION TO A DATA PROCESSING METHOD BY GARBING THEIR CLAIMS 8 AND 13 WITH DIGITAL COMPUTER OPERATIONS OR WELL-KNOWN HARDWARE	13

PAGE

IV. PROGRESS IN THE DIGITAL COMPUTER FIELD WILL NOT BE PROMOTED BY GRANTING PATENTS ON MATHEMATICAL EXPRESSIONS OR ALGORITHMS 17

A. The Computer Is Merely a Tool With a Greater Capacity for Performing Mathematical Calculations 17

B. Evaluation of Potential Liability for Infringement of Patented Algorithms and Mathematical Expressions Would Be Impractical 18

V. PROGRAMS ARE ALREADY ENTITLED TO COPYRIGHT PROTECTION 22

VI. CONGRESS IS THE PROPER BODY TO CREATE LAWS REGARDING PROGRAMS 24

CONCLUSION 25

APPENDIX A 1a

APPENDIX B 12a

TABLE OF AUTHORITIES

Cases:

Application of Benson & Tabbot, 441 F.2d 682 (C.C.P.A. 1971) 8, 9, 16, 5a

Application of Bernhart, 417 F.2d 1395 (C.C.P.A. 1969) 14-15

PAGE

Application of Foster, 438 F.2d 1011 (C.C.P.A. 1971) 15

Fortnightly Corp. v. *United Artists Tel. Inc.*, 392 U.S. 390 (1968) 24

Funk Bros. Seed Co. v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948) 4, 16

Graver Tank & Mfg. Co. v. *Linde Air Prods. Co.*, 339 U.S. 605 (1950) 15

Le Roy v. *Tatham*, 55 U.S. (14 How.) 156 (1852) 4, 16

Application of Mahony, 421 F.2d 742 (C.C.P.A. 1970) 15

Application of Musgrave, 431 F.2d 882 (C.C.P.A. 1970) 15

Application of Prater, 415 F.2d 1378 (C.C.P.A. 1968) 14

Application of Prater, 415 F.2d 1393 (C.C.P.A. 1969) 14

White-Smith Music Pub. Co. v. *Apollo Co.*, 209 U.S. 1 (1908) 24

United States Constitution and Statutes:

Article I, § 8, Clause 8 9

17 U.S.C. §§ 1, 4 (1970) 22

17 U.S.C. § 1(e) (1970) 24

28 U.S.C. §§ 1291, 1338, 1498 and 1542 (1970) 15

35 U.S.C. § 100(b) (1970) 9

PAGE

35 U.S.C. § 101 (1970) 9

35 U.S.C. § 112 (1970) 13

35 U.S.C. § 154 (1970) 19

Miscellaneous:

G. Boole, The Laws of Thought (1854) 1a

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In the

Supreme Court of the United States

October Term 1971

No. 71-485

Robert Gottschalk,
Acting Commissioner of Patents,

Petitioner,

—*v.*—

Gary R. Benson and Arthur C. Tabbot,

Respondents.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF *AMICUS CURIAE* FOR BURROUGHS CORPORATION

Preliminary Statement

Burroughs Corporation (hereinafter Burroughs) is filing this brief *Amicus Curiae* on the merits in support of the Petitioner, the Acting Commissioner of Patents, pursuant to Rule 42 of the Supreme Court. The requisite written consents of the parties are on file with the Clerk of the Court. The matter is before the Court on a writ of certiorari to the United States Court of Customs and Patent Appeals which had reversed the decision of the Patent Office Board of Appeals affirming the Patent Examiner's rejection of claims 8 and 13 as unpatentable.

Questions Presented

1. Whether a mathematical expression or algorithm is patentable.

2. Whether an otherwise unpatentable mathematical expression or algorithm can be rendered patentable by describing it as a data processing method to be carried out by a general-purpose digital computer.

Interest of *Amicus Curiae*

Burroughs was incorporated in 1905, and is engaged in the business of designing, manufacturing and marketing a comprehensive range of products for the recording, storing, computing, processing and communicating of data. Burroughs business includes the development and maintenance of computer software for use with Burroughs computer products. Approximately 1800 professional employees are engaged full time in the company's research and development activities which resulted in an expenditure of $47,000,000 for the year 1971. A significant portion of these employees and of Burroughs research and development expenditure are attributable to the generation and support of computer software.

For the year which ended December 31, 1971, the dollar value of world-wide computer shipments has been reported to be $7,440,000,000. The actual sales value of Burroughs EDP shipments for the year 1971 amounted to approximately $531,000,000.

The disposition of the patent application before this Court will be of little significance to Burroughs since Bur-

roughs without further obligation and as part of a broader grant obtained a license nearly ten years ago to use the development covered by respondents' patent application. However, Burroughs believes that the general questions presented herein are much broader than potential liability under a single patent and, in fact, are of such great importance that an affirmance of the court's opinion below could well provide a crippling effect on the growth of the computer industry.

In view of Burroughs substantial involvement in the computer industry, it is Burroughs desire to bring before this Court several aspects of the questions presented in this case that may not be presented in the Petitioner's brief:

first, the historical development of mathematical expressions or algorithms as part of the "liberal arts" rather than the "useful arts";

second, the important distinction between mathematical principles and computer hardware;

third, the excessively broad scope of the patent applied for in this case, *i.e.*, a patent for the algorithm itself, even though the language of the claim gives the impression that the patent covers only specific computer hardware or operations;

fourth, the unreasonably broad and restrictive burden on the use of data processing equipment that would result from the patentability of algorithms or mathematical expressions; and

fifth, the availability of alternate means for protecting authors of computer programs based on algorithms or mathematical expressions.

Summary of Argument

The court below has either failed to understand the true nature of respondents' contribution or announced that mathematics is now for the first time embraced within the "useful arts" and can be patented. The clear implication of prior decisions of this Court is that mathematics, principles of nature and other abstract concepts are not patentable. *Funk Bros. Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948); *Le Roy* v. *Tatham*, 55 U.S. (14 How.) 156 (1852). Accordingly, it is more likely that the court below failed to appreciate the true nature of respondents' contribution which is an algorithm or mathematical expression. Upon reading respondents' patent application and arguments appearing in the Record below there can be no doubt that respondents have made a trivial modification to a well-known algorithm using an equally well-known principle of mathematics. Further, the most likely place to find prior art to be used against respondents' contribution is in mathematical textbooks and literature.

The confusion in this case stems from the way in which respondents have drafted their patent claims (*see* Appendix B, *infra*, pp. 12a-13a). Respondents have attempted to disguise the true nature of their contribution by garbing the patent claims with recitations that appear to be directed to hardware components of digital computers and digital computer operations. Even though algorithms and mathematical expressions are capable of being programmed for use on a general-purpose digital computer, they are not patentable since the computer does not change their

identity in any way; they are still merely algorithms. Nevertheless, by this association with the digital computer, respondents have, according to the court below, successfully managed to bring their algorithm or mathematical expression within the purview of the patent statutes. However, respondents have drafted their claims in a way which does not limit their patent coverage to the performance of their algorithm on any particular digital computer. The court below failed to grasp the extraordinarily broad scope of these claims, *i.e.*, a monopoly on the algorithm, *per se*. This would prevent any individual from using the algorithm or mathematical expression to write a series of program instructions to be executed by *any* general-purpose digital computer.

The practice of obtaining patents on algorithms or mathematical expressions will not *promote* progress in the digital computer field. The computer is just another tool for solving mathematical equations and algorithms, and these patents would restrict the freedom of the computer user. For the first time computer users, such as banks, government, universities and industry would run the risk that the algorithms or mathematical expressions they develop during the course of their normal use of the computer might "infringe" patents of others covering algorithms or mathematical expressions. Because of the abstract nature of this type of development, determining validity of patents and searching the prior art would be an enormous burden on the computer user. Such patents would not be consistent with the mandate in the Constitution to *promote* the progress of science and the useful arts.

Individuals who prepare computer programs based on algorithms or mathematical expressions can copyright their programs. While copyrights will not protect the algorithm, it will protect the investment made in writing the set of instructions comprising the program. If more protection is needed, Congress is the appropriate body to identify these needs and enact legislation specifically tailored to accommodate this new technology.

ARGUMENT

I.

MATHEMATICAL EXPRESSIONS AND ALGORITHMS ARE NOT EMBRACED IN THE "USEFUL ARTS" AND SHOULD NOT BE PATENTABLE.

A. The Essence of Respondents' Contribution Is a Modification of a Well-Known Algorithm or Mathematical Expression.

The respondents have characterized their invention as an algorithm during the prosecution of their patent application before the Patent Office.[1] The word "algorithm" was derived from the word "algorism", which meant the art of computing with arabic numbers.[2] Respondents have also provided a definition of an algorithm: " . . . a self-consistent set of ordered steps specifying definable operations and leading to a desired result."[3] Algorithms have been

[1] "To avoid further difficulties, it is here expressly admitted that applicants' method claims are directed to a machine algorithm for converting binary-coded-decimal representations into binary representations." R. 34 [References to the record in this case are indicated by "R."]

[2] VAN NOSTRAND'S SCIENTIFIC ENCYCLOPEDIA 59 (4th ed. 1968).

[3] R. 34.

created by mathematicians for centuries,[4] and some examples of the "classical algorithms" are addition, subtraction, multiplication and division.[5] The best known algorithm is Euclid's algorithm for finding the highest common factor of two given numbers.[6] Other commonly used algorithms include the extraction of square root,[7] radix conversion[8] and algorithms for converting decimal numbers, the most commonly used number system, to binary numbers, the number system used in digital computers.[9] The respondents have characterized their contribution as an " . . . algorithm or method for BCD-to-binary conversion." R. 55. At another point in their brief in the court below, respondents said, "It can be seen that appellants' most basic contribution to the art of digital data processing is in the *method* of translating BCD character representations to ordinary binary number representations. This overall method appellants have termed an 'algorithm' in accordance with common usage in the programming art." R. 59. The abbreviation BCD stands for Binary Coded Decimal which means that each decimal number is individually coded in binary form. Re-

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[4] A systematic method to transform fractions was given in the 1667 Edition of William Oughtred's *Clavis Mathematics*, Chapter 6, Section 18. *See* 2 D. KNUTH, THE ART OF COMPUTER PROGRAMMING 288 (1969).

[5] *Id.* at 229.

[6] VAN NOSTRAND'S SCIENTIFIC ENCYCLOPEDIA 59 (4th ed. 1968).

[7] A. BOOTH & K. BOOTH, AUTOMATIC DIGITAL CALCULATORS 184 (2d ed. 1956).

[8] Radix conversion techniques (for conversion of values from one numerical system to those of another) originated in ancient problems dealing with weights, measures and currencies. 2 D. KNUTH, THE ART OF COMPUTER PROGRAMMING 288 (1969).

[9] A. BOOTH & K. BOOTH, AUTOMATIC DIGITAL CALCULATORS 190-92 (2d ed. 1956).

spondents' algorithm then converts each such decimal number into a single continuous binary number composed of a string of "ones" and "zeros".[10] There can be no doubt that respondents' contribution is in the nature of an algorithm or mathematical expression.

Respondents have said that, "In order to overcome the disadvantages of the prior art conversion procedures, appellants have invented a completely different algorithm or method for BCD-to-binary conversion." R. 55. This is not the case. Upon even the most casual review by those skilled in the art of mathematics it is clear that respondents have at best modified a well-known algorithm[11] using a principle of mathematics known as "factoring".[12] By factoring the well-known algorithm fewer steps are required in order to carry out the arithmetic.[13] Furthermore, factoring eliminates the need to save and store partial results which would have to be added together at the end of the conversion. The court below identified this particular feature as an advantage of respondents' contribution,[14] although the court apparently did not appreciate the nature of respondents' contribution. A clear understanding by those with only a slight acquaintance with the mathematical principle of fac-

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[10] An example of respondents' algorithm is included in Appendix A, *infra*, pp. 3a-4a.

[11] *See, e.g.*, HIGH-SPEED COMPUTER DEVICES 411 (W.W. Stifler, Jr., ed. 1950).

[12] A. BOOTH & K. BOOTH, AUTOMATIC DIGITAL CALCULATORS 191 (2d ed. 1956).

[13] Appendix A, *infra*, pp. 3a-4a, describes the technique of factoring as it applies to converting a typical example of a decimal number into a binary number.

[14] Application of Benson & Tabbot, 441 F.2d 682, 683 (C.C.P.A. 1971).

toring will result in the conclusion that respondents' contribution is a trivial one. However, the primary purpose of the arguments made in this section and the examples given in Appendix A[15] is to identify the *nature* of respondents' contribution which is merely a modification of an algorithm or mathematical expression.

B. Mathematical Expressions and Algorithms Are Part of the "Liberal Arts" and Not Part of the "Useful Arts".

Congress has enacted laws pursuant to the United States Constitution[16] which provide for the issuance of patents to promote the progress of science and "useful arts".[17] The court below has found that respondents' alleged invention is part of the "useful arts" rather than the "liberal arts".[18] Since the essence of respondents' contribution is in fact an algorithm or mathematical expression the lower court's decision, if left standing, would in effect permit mathematics to be patented for the first time.[19] It is our belief that the court did not truly understand the nature of respon-

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[15] *See* Appendix A, *infra*, pp. 1a-11a.

[16] "The Congress shall have the power . . . to promote the progress of science and *useful* arts . . ." U.S. CONST. art. I, § 8, Clause 8 (emphasis added).

[17] "When used in this title [35, Patents] unless the context otherwise indicates—(b) The term "process" means process, art or method, and includes a new use of a known process, machine manufacture, composition of matter or material." 35 U.S.C. § 100(b) (1970);
"Whoever invents or discovers any new and useful process, . . . or any new and useful improvement thereof, may obtain a patent therefor . . ." 35 U.S.C. § 101 (1970).

[18] Application of Benson & Tabbot, 441 F.2d 682, 688 (C.C.P.A. 1971).

[19] The negative effects of such a decision are reviewed in Section IV, *infra*, pp. 17-22.

dents' contribution.[20] However, respondents had a much clearer understanding of the nature of their invention during prosecution of their patent application when they made the following challenge to the U.S. Patent Office Examiner: "Applicants challenge the Examiner to cite any decision of any court or other tribunal in which it is stated that mathematical calculations, per se, as distinguished from the mental process of performing such calculations are unpatentable." R. 36. This challenge should not escape final determination by this Court. Mathematics has been a part of the "liberal arts" for centuries.[21] As part of this Court's decision in this case, it appears to be necessary to state that mathematical expressions and algorithms and any other form of mathematics, *per se*, are not patentable.

II.

MATHEMATICAL EXPRESSIONS OR ALGORITHMS ARE NOT PATENTABLE EVEN THOUGH THEY MAY BE PROGRAMMED ON A GENERAL-PURPOSE DIGITAL COMPUTER.

An attempt has been made to classify respondents' algorithm as a special kind of algorithm because it has been associated with a general-purpose digital computer. Respondents have attempted to label their algorithm as a

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[20] This possibility is explored in Section III, *infra*, pp. 13-17.

[21] "Liberal Arts . . . 1: the studies comprising the trivium [grammar, rhetoric and logic] and quadrivium [arithmetic, geometry, music and astronomy] in the middle ages 2: the studies (as language, philosophy, history, literature, abstract science) esp. in a college or university that are presumed to provide chiefly general knowledge and to develop the general intellectual capacities (as reason or judgment) as opposed to professional, vocational, or technical studies . . ." WEBSTER'S NEW INTERNATIONAL DICTIONARY—UNABRIDGED 1303 (3d ed. 1963).

"machine" algorithm.[22] This is misleading and confusing. The fact that respondents' algorithm, or any other algorithm or mathematical expression, can be used as a basis for writing a program in no way changes the nature of the algorithm or mathematical expression. The typical procedures followed in writing programs are outlined below.

A mathematician, logician or other theoretician selects a known algorithm or derives a new algorithm which represents the minimum time or optimum way of solving a given problem. The technique that each of these individuals use to arrive at the algorithm depends upon his background and educational training. Some theoretical mathematicians prefer to use classical algebraic expressions while logicians may use another branch of mathematics known as "Boolean algebra" or "Truth Tables".[23]

After the algorithm is established, a "flow-chart" or other diagram may be prepared that represents the way in which the numbers, data or other information will flow during the progressive solution to the problem. To implement the flow-chart, trained programmers prepare a list of instructions in a programming language selected from among a number of different possible languages. Typical programming languages are ALGOL (ALGOrithmic Language), FORTRAN (FORmula TRANslation), COBOL (COmmon Business Oriented Language), PL I (Programming Language I), as well as the various programming languages used by respondents in their own list of instructions. R.

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[22] "To avoid further difficulties, it is here expressly admitted that applicants' method claims are directed to a machine algorithm for converting binary-coded-decimal representations into binary representations." R. 34.

[23] *See* Appendix A, *infra*, pp. 5a-11a, which illustrates these techniques.

57, 81. Each of these programming language instructions is then recorded on a punched card, magnetic tape or some other form of record by keyboard operators. This record is then compiled (translated) into a series of new program instructions in another language commonly called a machine language or object code. These translated instructions are capable of directly controlling the operation of a general-purpose digital computer. The actual translation is normally accomplished on a computer which itself has been programmed in a special way depending upon the particular programming language, *e.g.*, ALGOL or FORTRAN, selected by the programmer. Translations can be made to accommodate many different general-purpose digital computers. These computers may vary in size and contain different hardware components for performing a given computer operation. The operator places the translated program into the storage facility of the computer and at the same time may similarly place the data which is to be processed by the computer. This completes the series of steps starting with the algorithm and ending with a programmed general-purpose digital computer.

The algorithm that was originally established by the mathematician, logician or other theoretician remains *unchanged and unaffected* by the programmers, operators and others who are involved in preparing the program. Accordingly, algorithms used as the basis for writing programs are nevertheless merely algorithms. The obscure language form of the steps taken by the programmers and the complexity of the digital computer itself should not mislead one into the conclusion that algorithms become special or somehow different (*i.e.*, a "machine" algorithm) through their association with the general-purpose digital computer.

III.

RESPONDENTS HAVE ATTEMPTED TO SHIFT THE ESSENCE OF THEIR CONTRIBUTION FROM AN ALGORITHM OR MATHEMATICAL EXPRESSION TO A DATA PROCESSING METHOD BY GARBING THEIR CLAIMS 8 AND 13 WITH DIGITAL COMPUTER OPERATIONS OR WELL-KNOWN HARDWARE.

There are two claims remaining in respondents' patent application for consideration by this Court.[24] Each claim has recitations which emphasize hardware components of computers[25] or operations performed by digital computers.[26] These recitations are completely inconsistent with the fact that respondents' only contribution is an algorithm or mathematical expression. As pointed out in Section I,[27] respondents have repeatedly described their contribution as an algorithm. Further, these recitations are inconsistent with the patent disclosure made by respondents; a *program* is the "best mode" of respondents' invention.[28] The respondents did not set out to patent the general-purpose computer, *per se*, but indicated that their invention relates

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[24] Claims 8 and 13 are reproduced in Appendix B, *infra*, pp. 12a-13a.

[25] "Reentrant shift register" in claim 8. Appendix B, *infra*, p. 12a.

[26] "Storing, shifting, masking, adding, testing, detecting, exhausting and repeating" in claims 8 and 13. Appendix B, *infra*, pp. 12a-13a.

[27] *Supra*, pp. 6-10.

[28] "The patent disclosure was made in terms of programming a general-purpose computer, however, because this is 'the best mode contemplated by the inventor of carrying out his invention'. (35 U.S.C. 112)" R. 57. Disclosure of the "best mode" is required by statute, 35 U.S.C. § 112 (1970).

to programming." Accordingly, it is misleading to include these recitations in claims 8 and 13.

These recitations are also improper because they do not serve to restrict the scope of respondents' claims in any way, and permit the respondents to obtain a monopoly as broad as the algorithm. Taking claim 8 for instance, the words "reentrant shift register" sound like a hardware component of a digital computer. However, upon examining the function performed by this component it is readily apparent that there are numerous equally suitable components that can perform the same function." Further, each of these can perform the same function in respondents' algorithm equally well. Accordingly, the algorithm is not enhanced, changed or any more readily suited for operation on a "reentrant shift register" than on any of the other equally suitable hardware components. It would seem that this recitation was placed in claim 8 for the purpose of causing respondents' algorithm to appear to be critically dependent upon a unique component of a general-purpose digital computer. This would presumably allow respondents' algorithm to be called a "machine" algorithm, thereby fitting it within the line of decisions announced by the court below regarding computer programs."

" "This invention relates to the processing of data by program and more particularly to the programmed conversion of numerical information."

"A program is a set of instructions for processing data in a preassigned fashion. The program consists of a series of steps, each of which include one or more instructions whose location in storage is given by an accompanying address." R. 3.

" *E.g.*, rotating drums, delay lines, random access memories, tape loops.

" Application of Prater, 415 F.2d 1378 (C.C.P.A. 1968); Application of Prater, 415 F.2d 1393 (C.C.P.A. 1969); Application of

The problem now becomes one for the prospective infringer and the district courts, since the court below does not have jurisdiction over matters of infringement."

Doctrine of Equivalents

Prospective infringers are well aware of the doctrine of equivalents[11] applied by the courts which try questions of infringement.[12]

The recitation in claim 8 of a "reentrant shift register" is likely to be a very thin shield for the prospective infringer to hide behind. No doubt in any case where the essence of the invention is in the algorithm, the party who programs a general-purpose computer to perform the algorithm will be found to be guilty of infringement. This would be so regardless of the particular names of hardware components recited in the patent claims. Respondents have already stated that this is the case, "This algorithm or method can be equally well implemented by con-

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Bernhart, 417 F.2d 1395 (C.C.P.A. 1969); Application of Mahony, 421 F.2d 742 (C.C.P.A. 1970); Application of Musgrave, 431 F.2d 882 (C.C.P.A. 1970); Application of Foster, 438 F.2d 1011 (C.C.P.A. 1971).

[11] 28 U.S.C. §§ 1291, 1338, 1498, 1542 (1970).

[12] "'. . . a patentee may invoke this doctrine to proceed against the producer of a device 'if it performs substantially the same function in substantially the same way to obtain the same result.' . . . The theory on which it is founded is that 'if two devices do the same work in substantially the same way, and accomplish substantially the same result, they are the same, even though they differ in *name, form or shape.*'" *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 608 (1950) (emphasis added).

"This situation emphasizes the anomaly where the Court of Customs and Patent Appeals is able to require certain claim language although it will never have to interpret that language in the context of infringement or the range of equivalents.

ventional circuitry . . . or by programming another general-purpose computer. . . . Moreover, each of these implementations is obvious from the others (appellants' attorney prepared the implementations . . . without technical assistance). For these reasons, method claims were included in the present application." R. 50.

The facade of computer hardware is even more transparent in claim 13 which has no hardware component recitations, but instead has very broad language directed to general-purpose digital computer operations." This language is not limiting at all since it reads equally well on any form of general-purpose digital computer. Accordingly, this claim, as it stands, without the necessity of employing the doctrine of equivalents, obtains for the respondents a monopoly as broad as the algorithm, *per se*.

Garbing the Principle of Mathematics

Recitations relating to computers were found by the court below to be significant at least with regard to claim 8." This is clear error. This Court has held that the discovery of a natural principle is not patentable and that if this discovery is the only contribution that the inventor has made, he is not entitled to a patent since this would in effect allow a patent to issue on the natural principle itself." The case here is analogous. Respondents' con-

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" *See* n.26, *supra*, p. 13.

" "Claim 8 is for a method to be practiced in part on particular apparatus specified to be a 'reentrant shift register'." Application of Benson & Tabbot, 441 F.2d 682, 687 (C.C.P.A. 1971) (emphasis in original).

" Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948); *Le Roy* v. Tatham, 55 U.S. (14 How.) 156, 175 (1853).

tribution is a mathematical expression or algorithm. Garbing claims 8 and 13 with meaningless recitations cannot disguise the true nature of respondents' contribution. If the lower court decision is left standing, it will invite others to garb their claims with language directed to the obvious hardware components of machines in order to secure patent protection upon mathematical equations, algorithms and other principles of mathematics.[18] This practice would no doubt spread beyond the digital computer field and could be applied to all other industries as well, since mathematics has a virtually unlimited application. A simple algorithm could then lead one to dominate the field of application merely by reciting the type of machine and a few of its obvious components, whether it be for such diverse arts as weaving machines or pumps.

IV.

PROGRESS IN THE DIGITAL COMPUTER FIELD WILL NOT BE PROMOTED BY GRANTING PATENTS ON MATHEMATICAL EXPRESSIONS OR ALGORITHMS.

A. The Computer Is Merely a Tool With a Greater Capacity for Performing Mathematical Calculations.

The general-purpose digital computer is just another tool for mathematicians, logicians, theoreticians and others who require the solutions to complex problems. Prior to the advent of the digital computer, problems were solved on mechanical calculators and, prior to that, with pencil and paper. Patents granted on algorithms, such as the one

[18] The adverse effect upon the digital computer field is discussed in Section IV, *infra*, pp. 17-22.

before this Court, would grant the owner an extremely broad monopoly inconsistent with the contribution made to the general reservoir of human knowledge. Such patents would restrict the users of all general-purpose digital computers which are programmed to solve a given algorithm. There is no difference between this type of restriction and attempting to restrict the *manner of using* mechanical calculators or even pencil and paper as distinguished from the apparatus themselves. Patents of this type would impede progress because the computer is merely a tool having greater capacity to assist in solving problems that are otherwise solvable only by tedious human effort. The power of the digital computer is increasing, and the complexity of the algorithms and mathematical expressions which it can solve is also increasing. As the importance of this tool to the technological and scientific community increases, its growth should not be encumbered by patents covering the algorithms and mathematical expressions it is designed to solve.

B. Evaluation of Potential Liability for Infringement of Patented Algorithms and Mathematical Expressions Would Be Impractical.

Algorithms and mathematical expressions could reside in many different forms. For example, they may take the form of printed program listings as illustrated by respondents (R. 57, 81), punched cards, magnetic tape, magnetic disks and many other forms of records. The records themselves can be readily transported from one general-purpose computer to another. The algorithm can also be transported without moving the records by simply reading one record and transmitting signals via telephone lines, micro-wave conduits, radio transmission or satellite communication sys-

tems to a record at any other point in the world. The number of computer installations and the number of programmers are expanding rapidly. Accordingly, the potential number of sites for infringement to take place is correspondingly increasing. This, coupled with the high degree of mobility of the program makes detection of patent infringement impractical.

Infringement could also be deliberately avoided by exporting the program to a computer facility outside of the United States and performing the algorithm beyond the bounds of protection afforded by the U.S. patent laws.[*] The processed data could then be returned to the United States. Such an operation would be appealing since most countries have denied patent protection to algorithms such as that proposed by respondents. This would not only frustrate the patent owner but also provide an inducement for carrying on data processing operations outside the U.S. thereby denying the U.S. economy the benefit of the revenue produced by such operations.

Assuming that a computer program has been found and is alleged to infringe a patent, it will be necessary to determine its validity. This would be an extremely difficult task because there is no accepted way of representing algorithms so they can be classified and filed in a library of prior art. There is essentially no body of classified prior art in existence at this time which could be reasonably assembled and used by the U.S. Patent Office to examine patent applications of this type. Where, as in this case, the essence of the contribution is in a mathematical expression or algorithm, the most likely place to find prior art is in public and private

[*] The patent grant is to exclude others . . . in the United States. 35 U.S.C. § 154 (1970).

libraries containing textbooks, treatises and other literature dealing with various branches of mathematics. Some typical examples of the type of prior art that would have to be searched are found in Appendix A, which also illustrates that the same algorithm can be expressed in many different ways.[40] Accordingly, it would be expected that numerous invalid patents would be issued by the U.S. Patent Office and the burden of finding prior art would be shifted to members of the computer industry.

Specific Burdens to Be Placed Upon the Computer User

Computer users may be found in all branches of industry, science, health, finance, medicine, manufacturing, government and many more. Any one of these users can develop or adopt algorithms to be used as the basis for writing programs in accordance with the procedures briefly described in Section II.[41] Many of these users do not market products that are embraced by the patent laws. If algorithms are found to be patentable, for the first time these users would become possible "infringers". The computer user normally has little knowledge of the particular hardware components included in his general-purpose computer, or the nature of the operations taking place within the computer. He is concerned solely with the work the computer will perform for him with high speed and efficiency. The

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[40] In Appendix A, Third Example, *infra*, pp. 5a-8a, a classical mathematical expression is shown. In Appendix A, Fourth Example, *infra*, pp. 8a-11a, algorithms are expressed in accordance with mathematical languages used by logicians, commonly known as "Boolean algebra" and "Truth Tables".

[41] *See* pp. 11-12, *supra*.

user may not even own a computer or have one on his premises. In "time-sharing" systems, many users are connected via telephone lines to a central computing system and simply buy time on the computing system on a pay-as-you-go basis. The user may supply his own programs or borrow a program from a library. Accordingly, the user is not concerned with the particular type of machine on the other end of the telephone line but simply desires an end result, service to obtain a solution to his algorithm—the basis from which his program was written. It can readily be seen that if the user who is charged with infringement must examine claims, such as the present claim 8, which contain recitations defining hardware components of computers, he may lack the necessary design information regarding his computer. Accordingly, he will not be able to determine whether he is infringing. This lack of information may also prevent the user from obtaining a patent on an algorithm he has created. If it is necessary to recite computer hardware components in his claims, the user will be unable to translate the definition of his algorithm from a mathematical expression to an English language version using hardware components of a computer."

Computer users would quickly turn to the computer manufacturers and demand indemnification against patent infringement caused by programming the general-purpose digital computer in the same manner that they now demand and obtain indemnification on computer hardware. This would be like the purchaser of a piano or an adding machine asking the manufacturer for an indemnification against copyright or patent infringement caused by the

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" *See* Section III, *supra*, pp. 13-17, which explains the reason why the lower court decision would foster this practice and argues that this is not a satisfactory practice.

purchaser pushing any given sequence of keys to play music or perform a calculation. There is no doubt that some computer manufacturers would endeavor to indemnify as many customers as their financial resources would permit, even though it is as inappropriate for computers as it is for pianos and adding machines. For example, the price of the computers could be increased and a fund set aside to take care of patent problems as a form of insurance policy for computer users. This would not have a healthy impact on competition among the computer manufacturers, since the users may be inclined to gravitate to the computer manufacturer that offered the maximum patent indemnity secured by the greatest funds. The progress of the computer field would not be promoted by this, and in the long run, the computer user would suffer.

V.

PROGRAMS ARE ALREADY ENTITLED TO COPYRIGHT PROTECTION.

Denying patent protection on algorithms or mathematical expressions would not mean that individuals who develop computer programs would be without some form of federal statutory protection. In recent years there has been a growing tendency to protect programs by copyright.[43] The author generally grants a license to the computer user permitting the user to copy and run the program.

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[43] *All* writings of an author may be copyrighted, and the author has many exclusive rights to copyrighted work. 17 U.S.C. §§ 1, 4 (1970) (emphasis added).

Copyright protection for programs is appropriate because writing a program is analogous to writing other literary works, for example, music which has been copyrighted for many years.[44] The copyright law is preferable over other forms of statutory protection for programs because it will not produce the negative effects on the digital computer field outlined in Section IV.[45] The copyright law requires that an infringer actually copy another's copyrighted work. Should a programmer develop a program on his own without access to the copyrighted program, he need not concern himself with infringement. Also, the copyright laws would not protect the broad mathematical principles or algorithms which may have been used in the preparation of the program. Therefore, these mathematical principles and algorithms would remain in the public domain for free use by everyone. However, the effort and time spent in creating the particular set of instructions comprising the program would be protected by copyright.

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[44] A program is a list of instructions to be carried out by a computer; for respondents' lists, *see* R. 57, 94. Music written on paper, commonly called sheet music, is a series of notes written on a staff. The program is written in a notation called programming language such as ALGOL, FORTRAN, or COBOL (*See* Section II, *supra*, pp. 11-12). Music has its own separate form of notational language. Each one is an expression of a series of instructions to be executed or performed by machines or instruments. Both the program and music can be recorded in many different forms. For example, the program can be recorded on magnetic tape or disks and perforated cards or tapes. Music can be recorded on magnetic tape, phonograph records and perforated rolls. Continuing with the analogy as it applies to a program recorded on perforated tape and music recorded on a perforated roll, it can be seen that there is an equivalence between the general-purpose computer and the player piano. The computer processes data in accordance with a program of instructions recorded on perforated tape, while the player piano creates tones in accordance with the instructions recorded on the perforated roll.

[45] *Supra*, pp. 17-22.

VI.

CONGRESS IS THE PROPER BODY TO CREATE LAWS REGARDING PROGRAMS.

If a new federal statutory protection for programs is required, Congress is the proper body to enact that law. In the past, advances in technology have caused cases to be reviewed by this Court in light of laws written long before the advance in technology. An example of this occurred in the case of the cable TV technology[46] and much earlier in the case of recording copyrighted works.[47] In each of these cases, this Court had to apply an old statute to a technology which was developed after the passage of the statute. In doing so, this Court refused to extend the statute to cover the new technology, but instead left such action for Congress. In the case of recording copyrighted works, Congress responded by enacting a specific statute tailored to deal with the unique characteristics of the new technology.[48]

Programming is far more complex and has a much wider impact upon our society than any of the aforementioned new technologies previously considered by this Court. If there is a need for new federal statutory protection, or modifications to existing laws, the Congress should again enact the appropriate legislation.

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[46] Fortnightly Corp. v. United Artists Tel. Inc., 392 U.S. 390 (1968).

[47] White-Smith Music Pub. Co. v. Apollo Co., 209 U.S. 1 (1908).

[48] 17 U.S.C. § 1(e) (1970), was amended on March 4, 1909, the year after the White-Smith v. Apollo decision.

CONCLUSION

For the foregoing reasons, *Amicus Curiae* urges the Court to find that the subject matter of respondents' patent application is not embraced within the patent laws and, accordingly, that the decision of the Court of Customs and Patent Appeals be reversed.

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